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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/653,882	09/04/2003	Tse-Yao Huang	HUAN3211/EM	4935
23364	7590	05/13/2005	EXAMINER	
BACON & THOMAS, PLLC 625 SLATERS LANE FOURTH FLOOR ALEXANDRIA, VA 22314			LUK, OLIVIA T	
			ART UNIT	PAPER NUMBER
			2812	

DATE MAILED: 05/13/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/653,882

Applicant(s)

HUANG ET AL.

Examiner

Olivia T. Luk

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 February 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-8 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-8 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

ALEXANDER GHYKA
PRIMARY EXAMINER

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Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-3 and 5-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Donohoe et al. (6,890,863 B1) in view of Tang et al. (5,010,032).

In re claim 1, Donohoe et al. providing a substrate **100**; forming a pad oxide layer on said substrate, forming a pad nitride layer on said pad oxide layer; forming an oxide layer on said pad nitride layer (col. 7, lines 26-37); forming a mask **40** of a predetermined pattern on said oxide layer (col. 7, lines 39-42); and forming contact holes by plasma etching (col. 10, lines 7-10), the plasma etching using a plasma composition comprising argon, a first fluorocarbon and a second fluorocarbon, the fluorine-to-carbon ratio of said second fluorocarbon being higher than that of the first fluorocarbon (col. 5, lines 51-61 and col. 9, lines 25-30), but fails to teach an oxygen gas in the plasma composition.

Tang et al. teaches having oxygen gas in normal fluorine-based oxide etch chemistries for etching contact holes into oxides (col. 11, lines 55-59).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have included oxygen gas in the plasma composition with fluorocarbons for the etching of an oxide layer to make high aspect ratio contact holes of Donohoe et al. since

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the oxygen would not affect the end result and is known in the art for use in these types of etching.

In re claims 2 and 6, Donohoe et al. in view of Tang et al. is applied as above, Donohoe et al. further teaches the first fluorocarbon is C_5F_8 (col. 5, line 61).

In re claims 3 and 7 Donohoe et al. in view of Tang et al. is applied as above, Donohoe et al. further teaches the fluorine-to-carbon ratio of said second fluorocarbon is higher than 8:5 (col. 9, lines 10-15).

In re claim 5, Donohoe et al. teaches using plasma etching to open contact holes (col. 9, lines 1-10), and being characterized in that the plasma etching uses a plasma composition comprising argon, a first fluorocarbon and a second fluorocarbon, the fluorine-to-carbon ratio of said second fluorocarbon being higher than that of the first fluorocarbon (col. 5, lines 51-61 and col. 9, lines 25-30), but fails to teach an oxygen gas in the plasma composition.

Tang et al. teaches having oxygen gas in normal fluorine-based oxide etch chemistries for etching contact holes into oxides (col. 11, lines 55-59).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have included oxygen gas in the plasma composition with fluorocarbons for the etching of an oxide layer to make high aspect ratio contact holes of Donohoe et al. since the oxygen would not affect the end result and is known in the art for use in these types of etching.

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3. Claims 4 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Donohoe et al. (6,890,863 B1) in view of Tang et al. (5,010,032), as applied to claims 1-3 above, and further in view of Donohoe et al. (6,784,111 B2).

In re claims 4 and 8, Donohoe et al. in view of Tang et al. is applied as above, but fails to specify the second fluorocarbon is C_3F_8 .

Donohoe et al. (6,784,111 B2) teaches forming contact holes with plasma etching by utilizing a mixture gas having a high ratio of carbon/fluorine such as C_3F_8 , C_4F_8 , C_5F_8 , CO, etc. (col. 7, lines 3-4).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have used C_3F_8 as the high ratio fluorocarbon in the invention of Donohoe et al. (6,890,863) since both fluorocarbons as high ratio fluorocarbons and it has been held that finding the optimum value of a result effective variable involves only routine skill in the art.

Conclusion

4. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. References not applied are considered state of the art in the area of semiconductor manufacture.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Olivia T. Luk whose telephone number is 571-272-1676. The examiner can normally be reached on 8AM to 5PM Mon-Fri.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael S. Lebentritt can be reached on 571-272-1873. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

OTL
May 10, 2005

ALEXANDER GHYKA
PRIMARY EXAMINER

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